

Among the motors having an arc-shaped magnet, regardless whether it is a rare earth magnet or not, known technologies for reducing the cogging torque through a shape of the arc-shaped magnet include making a radius of the outer surface of the arc-shaped magnet to be different from that of the inner surface, or cutting edges at both ends in the circumferential direction of an arc-shaped magnet, thereby making a distribution of flux density in the air-gap closer to a sine curve (an example of the publication: Shogo Tanaka, "Application of Permanent Magnets for Small Motors", page 7 in the proceedings of the Symposium of Small Motor Technology, 1983). Japanese Utility Model Publication No. [S44-4651] S49-4651 discloses that, in a permanent magnet field small DC motor, a cut provided in an arc-shaped magnet in the outer surface at both sides off of the center of the magnetic pole suppresses reduction of effective flux at the center of magnetic pole, despite the reduction at the cut portion. Although there is no mention about the cogging torque in the Utility Model, there is an indication about a possibility that the cut provided in an arc-shaped magnet in the outer surface at both sides off of the center of the magnetic pole would reduce the cogging torque in a permanent magnet field small DC motor, while controlling deterioration of the rotating torque.

9. (Amended) An optical pickup device comprising: [the permanent magnetic field small DC motor of claim 1] a permanent magnet field small DC motor comprising[:] an arc-shaped permanent magnet fixed in a soft-magnetic frame, wherein said magnet is provided with an outer surface at both ends in a thrust direction that fits along an inner surface of said soft-magnetic frame, and a certain region in a middle part in the thrust direction of said magnet at both ends in the circumferential direction where said soft-magnetic frame does not function as a back yoke.